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(54) Power conserving scanning method

(57) A method of scanning an object for use in a battery powered scanner e.g. for fingerprints or bar-codes having the steps of scanning an object with low intensity light from a variable intensity first light source 101 and determining if the scan is satisfactory 102 by evaluating the signal to noise ratio. If the scan is not satisfactory, then increasing the intensity of the light of the variable intensity first light source 104 and scanning again 105 until a satisfactory scan is achieved or the maximum light intensity is reached 103 in which case a second flash light source having a greater intensity than the first light source is used for the scan 106. The scanner apparatus may comprise a variable light source, a flash and CCD array connected to a microprocessor controller for evaluating a satisfactory scan by determining the signal to noise ratio and the unit is battery powered. Alternatively both light sources may be variable and have the same maximum light intensity.

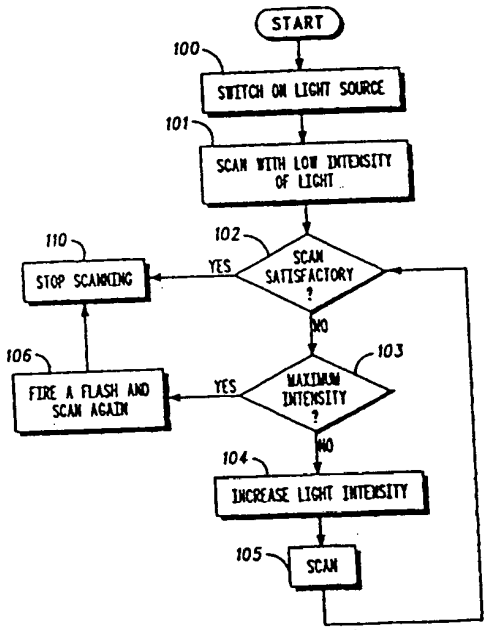

FIG.2

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

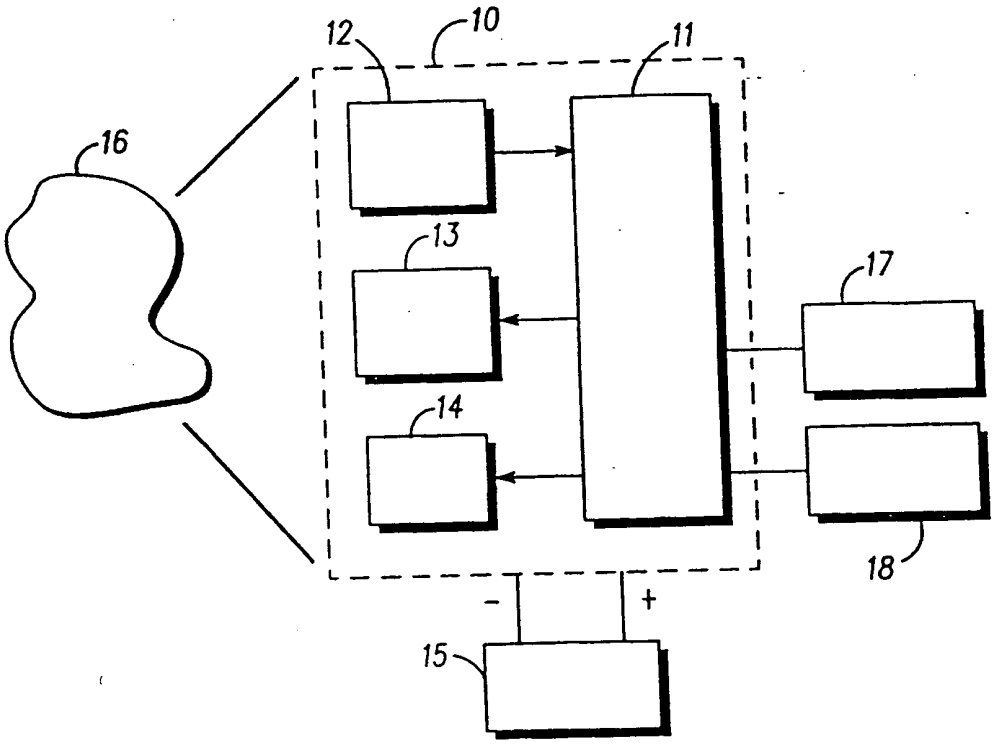

FIG.1

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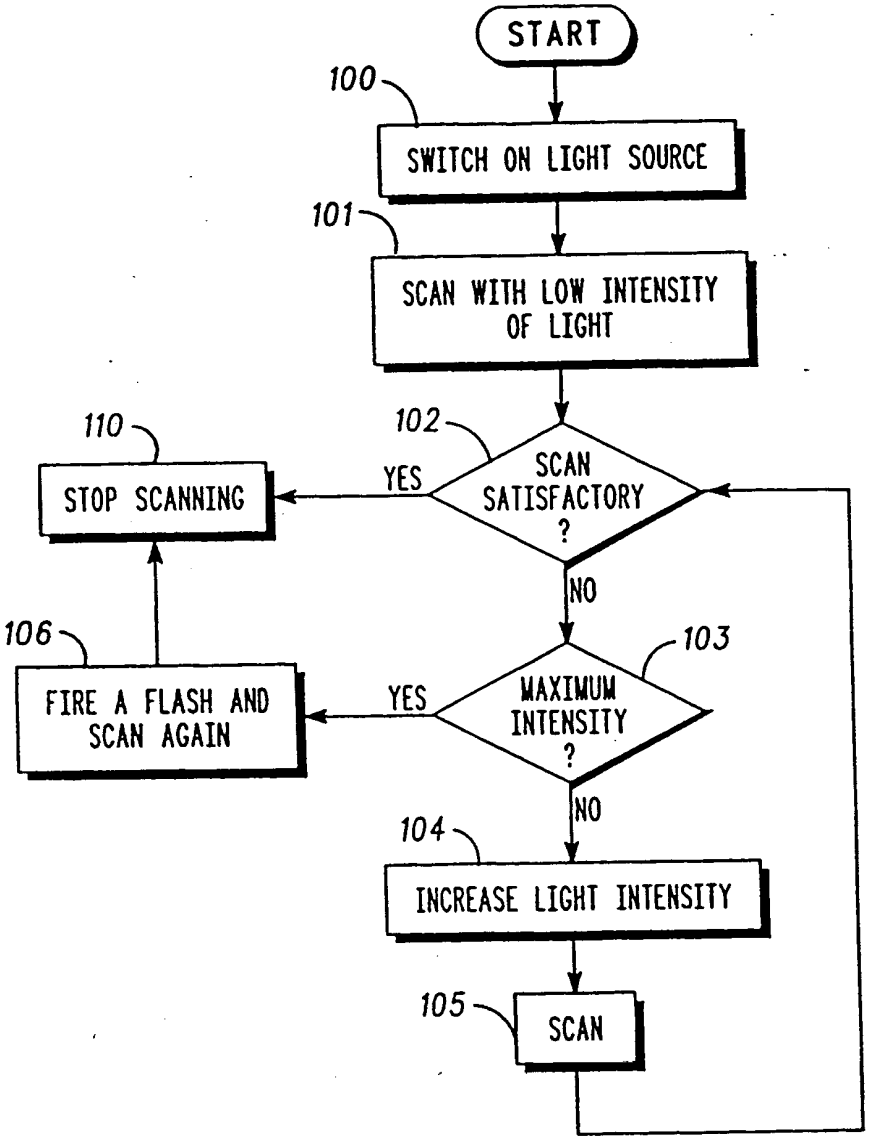

FIG.2

METHOD OF SCANNING

Field of the Invention

This invention relates to method of scanning an object. The invention is applicable but not limited to, a battery powered scanner.

Background of the Invention

A common application for scanners is the scanning of bar-codes. Bar-codes are markings placed on products comprising a series of black bars and white spaces. This encode information about the product typically including a product identifier which is used to price the product at a point-of-sale.

Charge Coupled Device (CCD) scanners accomplish the scanning of bar-codes by illuminating the code with supplemental illumination (typically provided by Light Emitting Diodes - LED's). The presence of a space is detected because it reflects back a relatively large amount of illumination, while the presence of a bar is detected because it reflects back only a little light. Once an image of the bar-code has been captured, a sampling circuit determines a whether each pixel is a zero or a one by reference to a threshold value.

The light source intensity must be sufficient to allow for the variations in light reflection from different bar-code sources and base materials, as well as variations in the distance of the bar-code pattern from the CCD, and the reduction in the reflected light signal bar-to-space ratio due to extraneous incident light.

Similar principles apply to scanners employed to scan other objects, for example a finger-tip so as to capture the fingerprint pattern. The presence of oil or dirt on the finger reduces discrimination between the lines (whirls, loops and arches) of the fingerprint, making scanning difficult.

For some scanning applications it is desirable for the scanner to be hand-held and battery powered. Such battery powered scanners are used by security personnel for scanning fingerprints, and bar-coded identity cards, or by the transportation and postal industries for parcel identification. However these battery powered scanners suffer from limited battery life due to the required high intensity light source.

This invention seeks to provide a method for scanning which mitigates the above mentioned disadvantages.

Summary of the Invention

According to a first aspect of the invention, a method of scanning an object for use in a battery powered scanner is provided. The method includes the steps of:

(a) scanning an object with low intensity light from a variable intensity first light source.

(b) determining if the scan is satisfactory.

(c) increasing the intensity of the light of the variable intensity first light source if the scan is not satisfactory and repeating the (a) to (c) steps, or

(d) stopping the scanning if the scan is satisfactory.

In this manner, the battery powered scanner is provided with a second light source of greater maximum intensity than the first light source and the second light source is used for subsequent scanning steps when the maximum intensity of the first light source does not provide a satisfactory scan.

By varying the intensity of the light source from a relatively low level to a higher level battery power is conserved because the light intensity used is sufficient to ensure the scan is satisfactory and will ensure that the highest intensity is only used when it is required.

Preferably, the battery powered scanner is a portable barcode scanner or a portable fingerprint scanner.

In a second aspect of the invention, an apparatus for scanning an object is provided. The apparatus includes a light detector, a controller having a an output operably coupled to at least one light source and an input operably coupled to the light detector and responsive to an output therefrom such that if the output is unsatisfactory the light intensity of the light source is increased.

Preferably, the apparatus is provided with a variable intensity light source and a fixed light source having an higher intensity then the maximum intensity then the variable intensity light source.

Such an apparatus will start scanning the object with a low intensity of light using the variable intensity light source then increasing the intensity of light to reach an optimum signal to noise ratio. If the maximum intensity of light from variable intensity light source is reached then, the fixed light source is activated to attain the required signal to noise ratio.

Preferably, the light decoder is a Charge Coupled Device array.

Preferably, the apparatus is a battery powered barcode scanner or a battery powered fingerprint scanner.

A preferred embodiment of the invention will now be described, by way of example only, with reference to drawing.

Brief Description of the Drawings

FIG. 1 is a block diagram of a battery powered scanner having variable intensity light source and a fixed light source, according to the preferred embodiment of the invention.

FIG. 2 is a flow chart of a method of scanning an object, according to the preferred embodiment of the invention.

Detailed Description of the Drawings

As is shown in FIG. 1, an apparatus 10 for scanning an object 16 includes a controller 11 having a first output operably coupled to variable intensity light source 13, a second output operably coupled to a fixed light source 14, an input operably coupled to a light detector 12, and a battery 15 for powering the apparatus 10.

The object 16 is a bar-code located on a product. The light detector 12 is a Charge Coupled Device array (CCD) and the fixed light source 14 is a flash tube.

In operation, the barcode scanner 10 starts to scan the object 16, with the lowest intensity of the variable intensity light source 13. The variable intensity light source 13 has a lower maximum intensity than the maximum intensity of the flash 14. The CCD array 12 receives the reflected light from the barcode mark 16 and translates it into a binary signal. The controller 11, which is a micro-processor, receives the binary signal from the CCD array 12 and analyses the signal to noise (S/N) ratio of the binary signal. If the S/N ratio is unsatisfactory the light intensity of the variable intensity light source 13 is increased by the controller 11 until it reaches the optimum S/N ratio. If the maximum intensity of light reached from variable intensity light source 13 and the optimum S/N ratio has not been reached then the controller 11 uses the flash 14 to reach the optimum signal to noise ratio.

The method of operation of the scanner 10 will now be described with reference to FIG.2.

In a first step of the method, step 100, the scanner 10 is activated by a user switching a switch (not shown). The variable light source 13 is switched on and the controller 11, detector 12 and the flash 14 are also made ready.

A scan of the bar-code 16 is then performed in step 101 utilising the low intensity light provided by variable light source 13. In this step light is reflected by the bar-code back to the CCD array 12 an output of which is then processed by the controller 11.

The output of the CCD array 12 is processed by the controller 11 to determine whether or not a satisfactory scan has been achieved, step 102. Many ways of determining this will be apparent to a man skilled in the art for example the signal to noise ratio of the output could be determined or a checksum of the encoded information could be verified. If the output is not satisfactory, then decision step 103 is made by the controller 11. On this step, the controller determines whether or not the variable light source is operating at its maximum intensity.

If the variable light source 13 is not operating at its maximum intensity, then the controller 11 instructs it to increase its intensity by one increment. This is step 104.

The next scan is performed in step 105 and the controller 11 returns to step 102.

Step 102, 103 are repeated and if the detector output is again unsatisfactory, then the light intensity is again increased and a further scan made. Steps 102 to 105 are thus repeated until either the scan is satisfactory or the maximum intensity of the variable light source has been reached. In the case of the scan being satisfactory, the next step after step 102 will be step 110 which is a step of stop scanning. In step 110 the light sources 13 and 14 are switched off until the user activates the scanner 10 again.

In the case of the scan being unsatisfactory and the variable light source 13 being at its maximum intensity then after step 103, step 106 is carried out. In step 106 the flash 14 is instructed by the controller 11 to "fire" that is to say discharged. The output of the detector 12 is then processed by the controller 11 and the next step is the stop scanning step 110.

After the stop scanning step 110, the information derived from the bar-code may be retained in memory 17 or passed to the output device 18 which, in this case, is a liquid crystal display unit.

Whilst in the preferred embodiment of the invention a flash is used other relatively high intensity light sources may be used.

In some embodiments of the invention, both the light sources may be made variable and both light sources may be made to have the same maximum light intensity.

Claims

1. A method of scanning an object for use in a battery powered scanner comprising the steps of:

(a) scanning an object with low intensity light from a variable intensity first light source;

(b) determining if the scan is satisfactory;

(c) increasing the intensity of the light of the variable intensity first light source if the scan is not satisfactory and repeating the (a) to (c) steps; or

(d) stopping the scanning if the scan is satisfactory.

2. The method according to claim 1, wherein the battery powered scanner is provided with a second light source; and

wherein the second light source is used for subsequent scanning steps when the maximum intensity of the first light source does not provide a satisfactory scan.

3. The method of claim 2 wherein the scan light source has a greater maximum intensity than the first light source.

4. The method according to any of the preceding claims wherein the battery powered scanner is a portable barcode scanner.

5. The method according to any of the preceding claims wherein the battery powered scanner is a portable fingerprint scanner.

6. An apparatus for scanning an object comprising:

a light detector;

a controller having an output operably coupled to at least one light source; and an input operably coupled to the light detector and responsive to an output therefrom such that if the output is unsatisfactory the light intensity of the light source is increased.

7. The apparatus according to claim 6, is provided with a variable intensity light source and a fixed light source having an higher intensity then the maximum intensity then the variable intensity light source.

8. The apparatus according to any one of the preceding claims wherein the light decoder is a Charge Coupled Device array.

9. The apparatus according to any one of the preceding claims is a battery powered barcode scanner.

10. The apparatus according to any one of the preceding claims is a battery powered fingerprint scanner.

11. An apparatus for scanning an object operating in accordance with anyone of claims 1 to 5.

12. An output derived by a method as claimed in anyone of claims 1 to 5.

13. A method of scanning an object for use in a battery powered scanner which method being substantially as hereinbefore described with reference to and as illustrated in the drawings.

The Patent Office

7

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Claims searched: 1 & 6

Examiner: Andrew Alton
Date of search: 9 August 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G1A: AFG, AFH, AMS, ASF; G4M: MCF

Int Cl (Ed.6): A61B 5/117; G06K 7/10,7/14,9/00,9/03,9/18,9/22,9/36; H04N 1/04

Other: Online database: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	US5250791	HEIMAN - See fig. 1 and col. 5, line19 to col. 7, line 16	1,6
X	US4972093	COCHRAN et al. - See col. 6, lines 33-44 and col. 8, line 34 to col. 9, line 30	6
X	US4097732	BURROUGHS - See fig. 1 and col. 1 lines 58-68 and col.6 lines 22-56	6
X	US3944979	DATA SOURCE - See fig. 1 and col. 4, lines 35-46	6

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.